Tiny Silicon Chip Will Revolutionize Car Technology

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Microstaq's MEMS valve technology will miniaturize automotive flow control systems and has the potential to revolutionize the entire world of flow control in the same way the transistor changed the electronic world

Microstaq engineers here have developed a tiny, silicon chip capable of controlling the refrigerant system in a car's air-conditioner, and this chip's broader applications hold the promise of a fluid controls revolution similar to one that rocked the electronics world with the invention of the transistor.

The Microstaq silicon valve is a micro-electro-mechanical systems (MEMS) product designed specifically for fluid control across a number of flow control applications. This tiny silicon wafer, about the size of a button, can control the flow of liquids, mists and gases at high pressures and high flows, replacing a traditional valve as large as a standard flashlight. Its lighter weight and smaller size coupled with its true linear flow control characteristics have the potential to lead to increases in vehicle fuel economy while reducing power consumption in every car, truck and SUV that uses it.

Microstaq has been testing the fluid-control microvalve on automotive air conditioners for the past three years at its labs in Bellingham, 90 miles north of Seattle, and anticipates production to get underway within two years.

Company cofounders Steve Booth and Jeff Chance believe that their patented technology has broader applications for vehicle stability control, transmission systems control and other automobile fluidic systems.

“In a demanding world marketplace, product miniaturization matters,” said Booth, also president of the company. “The market emergence of transistors, for instance, revolutionized the electronics industry through the miniaturization of electronic products. Now our powerful new silicon-based microvalve MEMS technology promises to revolutionize the fluid control world just as the transistor changed the electronics world.”

A typical automobile has 50 valves that need to be opened and closed automatically and regulated closely, he noted. In addition to controlling pressure, fluid-control valves regulate the rate the flow of fluid i.e. how brake fluid, transmission oil, refrigerants and other fluids are used in the car. Replacing the bulky mechanical valve devices with Microstaq’s tiny electronic chip has the potential to revolutionize automotive fluidic systems designs, leading to improved vehicle mileage and reduced automotive greenhouse gas emissions.

Its cost, size, weight, durability, performance and component integration capability offer strong benefits for auto manufacturers and automotive systems suppliers.

“It offers exciting cost savings for manufacturers and suppliers, coupled with increased product functionality and environmental benefits,” Booth said. “Even a half-mile-per-gallon increase in fuel efficiency could translate into eliminating hundreds of thousands of metric tons of auto emissions every year,” he added.

Microstaq’s proprietary, pressure-balanced valve design uses advanced silicon wafer processing technologies to fabricate a high-pressure, high

flow capable microvalve as compared to membrane or orifice-type microvalve designs. The Microstaq valve is designed to operate in the harsh temperature and pressure environments typical to many automotive flow control systems.

“There is great potential for this microvalve to be on every car in the world,” added Jeff Chance, executive vice president and COO.

Microstaq’s valve technology holds such great promise that the company received a $2 million federal grant in 2001 from the National Institute of Standards Technology’s Advanced Technology Program to develop its unique microvalve for a car’s air conditioner.